

REMARKS

Applicant respectfully requests the foregoing amendments be entered at least because they raise no new issues requiring further search and consideration.

Claims 4-6 are currently being amended. Claim 4 has been amended to change its dependency to a pending claim. Claim 5 has been amended to improve its readability without narrowing its scope. Claims 5 and 6 have also been amended to have the claim scope applicants intended in light of the recent Federal Circuit case of Superguide Corp v. DirecTV Enterprises, Inc., 358 F.3d 870, 69 USPQ 2d 1865 (Fed. Cir. 2004) which interprets the phrase “at least one of [A] and [B]” as meaning “A and B”.

This amendment changes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

After amending the claims as set forth above, claims 1, 4-7 and 17-18 are now pending in this application.

Rejections under 35 U.S.C. § 103

Claims 1, 5, 7 and 17-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,401,358 to Kadomura et al. (hereafter “Kadomura”) in view of U.S. Patent No. 5,883,005 to Minton et al. (hereafter “Minton”), U.S. Patent No. 5,342,448 to Hamamura (hereafter “Hamamura”) and U.S. Patent No. 4,662,977 to Motley et al. (hereafter “Motley”). Claim 6 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kadomura, Minton, Hamamura and Motley in view of U.S. Patent No. 6,331,701 to Chen et al. (hereafter “Chen”) or U.S. Patent No. 5,036,252 to Lob (hereafter “Lob”). Applicants respectfully traverse these rejections for at least the following reasons.

Independent claim 1 is directed to a layer-by-layer etching apparatus using a neutral beam, and includes, among other components, (a) “a plate-shape reflector which is positioned in a path of the accelerated beam and is tiltable. . . , whereby the reflector reflects and neutralizes the accelerated ion beam”, (b) “a shutter disposed between the neutral beam generator and the reaction chamber, for controlling the supply of the neutral beam into the

reaction chamber”, and (c) “a purge gas supply for supplying a purge gas into the reaction chamber.” The references cited in the rejection fail to disclose any of (a), (b) or (c) in the context of the apparatus as claimed in claim 1.

The Office Action alleges that Kadomura discloses a purge gas supply for supplying a purge gas into a reaction chamber. Kadomura, however, does not appear to disclose a purge gas supply in either of its two disclosed embodiments of Figure 1 and Figure 3. If the Examiner maintains the rejection based on Kadomura, applicants respectfully request the Examiner to specifically point out where in the Kadomura reference a purge gas supply is disclosed.

Kadomura also fails to disclose the shutter as recited in claim 1. The Office Action correctly acknowledges that Kadomura fails to disclose a shutter, but argues that it would have been obvious to modify the apparatus of Kadomura to include the shutter of Minton. Applicants respectfully disagree.

Kadomura disclose an ion generating chamber 21 that ionizes Ar gas (col. 6, lines 18-20, and 56-57), and drawing the ionized Ar into a neutral beam irradiation chamber 20 where the ions are neutralized by a charge exchange reaction with a background gas before being incident on a wafer via a charged particle removal electrode 26 (col. 6, lines 20-24).

Minton discloses a system using pulsed laser radiation 14 to breakdown gas in nozzle 8 (col. 5, lines 50-51) resulting in a hyperthermal beam of neutral reactive species (col. 5, lines 64-65). A motor mounted shutter 20, specifically a wide slot wheel, is employed to select a portion of the reactive species having a relatively narrow velocity range (col. 6, lines 35-40, and 54-56).

One skilled in the art would not have been motivated to include the shutter of Minton to shutter the neutral Ar beam of Kadomura. The shutter of Minton, a rotating wide slot wheel, is designed to be synchronized with the pulsed laser radiation so that only particles within a particular velocity range pass through the slot of the wheel. The Kadomura system, on the other hand, does not include a system where neutral reactive species are formed by a pulsed laser. Thus, including the synchronized shutter of Minton in the Kadomura system

would not select out a velocity range of particles, and one skilled in the art would have no reason to include it in the Kadomura system.

Moreover, the shutter as recited in claim 1 is disposed between the neutral beam generator and the reaction chamber. In Kadomura, neutralizing the Ar ions occurs via the electrode 26 within the chamber 20. Modifying the Kadomura system to include a shutter to block neutral species would necessarily require that the shutter be disposed within the chamber 20, in contrast to claim 1. Thus, even if Kadomura were modified to include a shutter the resultant apparatus would not meet the limitations of claim 1.

Kadomura also fails to disclose the plate-shape reflector which is tiltable as recited in claim 1. The Office Action correctly acknowledges that Kadomura fails to disclose a plate-shape reflector, but argues that it would have been obvious to modify the apparatus of Kadomura to include the plate of Motley. Motley provides no motivation to modify the Kadomura reference to include such a tiltable reflector. Kadomura discloses using a charged particle removal electrode 26 to neutralize charged Ar particles. The Office Action provides no motivation for why one skilled in the art would replace the charged particle removal electrode 26 with a plate shaped tiltable reflector to neutralize the particles.

Claim 1 further requires that plate-shape reflector “is tiltable to control an incident angle of the accelerated beam in a range of 75 to 85 degree from a vertical line with respect to a surface of the reflector.” The Office Action alleges that the specific claimed tiltable range is directed to a method limitation, and argues that method limitations are viewed as intended uses that do not further limit the claimed invention. Applicants respectfully submit that the tiltable range in claim 1 is not merely a method of use limitation. In claim 1, the reflector must be capable of being tilted in a range of 75 to 85 degrees. This limitation clearly distinguishes from a system which has a plate which may not be tilted outside the recited range, for example for the case where the plate is fixed such that the angle is outside of the recited range. Applicants respectfully submit that all of the limitations of claim 1 must be given weight in interpreting claim 1.

Moreover, Motley does not appear to disclose that the plate 50 is capable of being rotated “to control an incident angle of the accelerated beam in a range of 75 to 85 degrees from a vertical line with respect to a surface of the reflector” as in claim 1. Motley discloses specifically an angle of 45 degrees (col. 4, lines 3-6), and Figure 1 of Motley does not suggest that the range of angles includes 75 to 85 degrees.

The remaining references of Hamamura, Chen and Lob do not cure the deficiencies of Kadomura, Minton and Motley. Hamamura was cited for allegedly disclosing a gas controller and a shutter controller. Chen and Lob were cited for allegedly disclosing a particular type of ion source. None of Hamamura, Chen and Lob, however, suggest that Kadomura should be modified to include any of (a) “a plate-shape reflector which is positioned in a path of the accelerated beam and is tiltable . . . , whereby the reflector reflects and neutralizes the accelerated ion beam”, (b) “a shutter disposed between the neutral beam generator and the reaction chamber, for controlling the supply of the neutral beam into the reaction chamber”, and (c) “a purge gas supply for supplying a purge gas into the reaction chamber” as recited in claim 1.

The dependent claims ultimately depend from claim 1 and are patentable for at least the same reasons, as well as for further patentable features recited therein.

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of

papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R.
§1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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